"iron-shale." They are rounded or globular in form but never angular, and have the same "shaly" appearance as some of the sandstone fragments. On examination they prove to be oxidised masses of nickel-iron, and in some cases, in spite of their alteration, the Widmanstätten figures may be clearly recognised in them; they sometimes contain nuclei of unaltered nickel-iron. The larger of the well-known Canyon Diablo meteorites, which are of weights up to 300 or even 1000 lb., show no trace of alteration, but exhibit the pitted surfaces and other features of independent meteorites. Thus it would appear that at this locality there were two types of meteorites, one very easily acted upon by oxidation, and it is possible that some of the smaller "Canyon Diablo meteorites" may be only nuclei of the oxidisable variety.

All the American geologists who have studied the locality are in agreement as to the non-volcanic origin of this "crater"; Prof. G. K. Gilbert, however, has suggested a theory which has found wide acceptance. It is that the "crater" is due to the impact of a great meteorite or group of meteorites, which has produced the violent mechanical effects everywhere visible. The only analogous case that can be cited—and it is a rather remote one—is that of the meteorite of Knyahinya in Hungary, which weighed 660 lb., and, according to Haidinger, buried itself when it fell in 1866 to the depth of 17 ft., forming a circular pit 4 ft. in diameter and 4½ ft. deep. Coon Butte may not unnaturally be accepted as supplying a very suggestive explanation of the origin of the far larger lunar craters which present so many features in common with it.

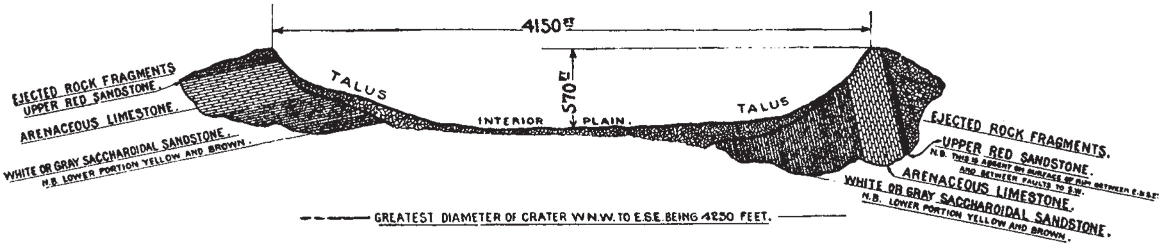
4150 ft
570 ft
TALUS
INTERIOR PLAIN.
TALUS
EJECTED ROCK FRAGMENTS
UPPER RED SANDSTONE.
ARENACEOUS LIMESTONE.
WHITE OR GRAY SACCHAROIDAL SANDSTONE.
N.B. LOWER PORTION YELLOW AND BROWN.
EJECTED ROCK FRAGMENTS.
UPPER RED SANDSTONE.
N.B. THIS IS ABSENT ON SURFACE OF RIM BETWEEN E.S.E. AND BETWEEN FAULTS TO S.W.
ARENACEOUS LIMESTONE.
WHITE OR GRAY SACCHAROIDAL SANDSTONE.
N.B. LOWER PORTION YELLOW AND BROWN.
GREATEST DIAMETER OF CRATER W.N.W. TO E.S.E. BEING 4250 FEET.

FIG. 2.—Cross-section of crater along a line approximately N.W. to S.E. Scale, about 1290 ft. = 1 in.

It must be confessed, however, that many unsolved difficulties remain to prevent our unhesitating acceptance of the meteoric theory. Chief among these is the question of what has become of the vast mass of matter capable of producing the shattering impact. Only scattered fragments of nickel-iron have been detected at the depths reached by the borings, and the existence of a vast mass of meteoric iron at greater depths finds no confirmation from the magnetic observations carried on in and around the "butte." In an appendix to the memoir an account is given of a striking suggestion on the subject by Prof. H. N. Russell. He argues that a great meteorite or group of meteorites, moving with planetary velocities, would, on reaching our atmosphere, drive before it a "wad" of air capable of crushing out the great circular cavity, while this same air, in its upward escape, would effect the upheaval of the rocks of the rim and the ejection of materials to distances up to two miles from it. The problem of the existence of the great meteorite at considerable depths or its gradual disappearance by oxidation still remains.

It is evident that the striking characters of this singular "crater" are of no less interest to astronomers—so suggestive are the characters in which it agrees with the vast lunar craters—than to geologists, who up to the present have been chiefly attracted by the phenomenon.

RECENT PUBLICATIONS OF THE CAPE OBSERVATORY.[1]

ALTHOUGH Sir David Gill retired from the direction of the Cape Observatory early in 1907, and died just seven years later, the volumes from that observatory which have recently been distributed are essentially his work. Even in the contributions of successor and collaborator Gill's inspiration and design are evident. It is not too much to say that the same spirit of energy and thoroughness will endure in the pages of future publications long after his name has disappeared from the title. No greater tribute can be paid to the memory of a great man. His personal achievement was considerable, but beyond that his influence on others will surely live.

These three volumes are typical of the three main currents to be observed in Gill's purely astronomical work. There is a zone of the Cape Astrographic Catalogue, a contribution to the great scheme of registering the positions of the stars by photography, with the inception and execution of which Gill was so largely identified. There is a volume of meridian work dealing both with the old transit circle and the new instru-

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[1] Cape Astrographic Zones. Vol. ii., Catalogue of Rectangular Co-ordinates and Diameters of Star-Images derived from Photographs taken at the Royal Observatory, Cape of Good Hope, commenced under the direction of Sir David Gill, completed and prepared for press under the supervision of S. S. Hough. Zone −42°. (Edinburgh: H.M.S.O.; London: Wyman and Sons, Ltd., 1914.) Price 20s.

Results of Meridian Observations of Stars made at the Royal Observatory, Cape of Good Hope, in the Years 1905 to 1908, under the direction of Sir David Gill and S. S. Hough. (Edinburgh: H.M.S.O.; London: Wyman and Sons, Ltd., 1914.) Price 30s.

Annals of the Cape Observatory. Vol. xii., Part i. Determination of the Mass of Jupiter and Elements of the Orbits of its Satellites from Observations made with the Cape Heliometer by Sir David Gill and W. H. Finlay. Reduced and discussed by Dr. W. De Sitter. Pp. 173. (Edinburgh: H.M.S.O.; London: Wyman and Sons, Ltd., 1915.) Price 6s.

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ment which he designed with such careful attention to detail for the fundamental astronomy of position in the southern hemisphere. And finally there is a volume, or part of a volume, containing a fine series of measures with the heliometer, the instrument with which Gill's reputation as a practical observer is associated. The reductions in this case have been made by the present professor of astronomy at Leyden, and illustrate Gill's remarkable power of attracting young and talented astronomers to a distant observatory and enlisting collaboration from outside in the schemes which he had at heart.

The present instalment of the Astrographic Catalogue bears the date 1914. Since the first volume is dated 1913, and each contains nearly a tenth of the whole share allotted to the Cape Observatory, it may be surmised that the publication of the whole will be completed towards the year 1925. With some allowance for preliminary work, this means that about thirty years will have been spent in carrying out the project. Two observatories, Greenwich and Oxford, have already finished and published their sections. If this appears to imply that the Cape Observatory has been dilatory, it is fair to notice that the portion undertaken at the Cape is about 30 per cent. in excess of the average; that it was necessary to observe the reference stars simultaneously with the meridian circle; and that an extremely high standard of accuracy has been aimed at and probably attained. It is also quite possible that in spite of the apparent delay the Cape Observatory will be the third to finish. If this be confirmed by the event, the first three observatories to accomplish their task will all be British. This may prove to be the only satisfactory feature in an undertaking which bids fair to be a dismal failure in the field of international co-operation.

One feature presents itself at a casual glance through the catalogue. On the whole, the number of stars per plate is very high. But the run of the numbers is far from regular, and can scarcely correspond with real variations of the star density in the sky. The minimum magnitude recorded on a plate is not constant. This is confirmed by the result of comparing each plate with the overlapping plates, which often shows that the majority of the stars on one plate are unrecorded in the contiguous zones. It is not, of course, a defect peculiar to the Cape plates, though perhaps more conspicuous here because no indication is given of the magnitude scale, and because those stars are marked which are missing in the overlapping zones. It is a small point, doubtless, and the irregularity could scarcely have been avoided. But it illustrates the wisdom of the conference, which, starting out with the avowed object of securing a certain minimum magnitude, laid down a hard and fast rule defining the times of exposure without any regard to the quality of the night or the speed of the plates. As a matter of fact, the sensitiveness of the plates used has probably increased by at least one magnitude since the rule was formulated. Thereby, as though the work had not palpably overtaxed the resources of most of the observatories already, the labour and expense have been augmented in two ways, first by the increase in the number of star images, and then by the supposed need of revising earlier plates in order to conform with the higher numerical standard. When all is said and done, the limiting magnitude on any given astrographic plate is practically an undetermined quantity.

The volume dealing with the meridian observations made during the years 1905–8 contains much descriptive and tabular matter chiefly of interest to the specialist. The individual results obtained with the new reversible transit-circle and given here will be ultimately combined to form a fundamental catalogue. Most of the work done with the older instrument was carried out at the request of the late Prof. Boss, and has already appeared in catalogue form. A further list of 381 miscellaneous stars is now published in the same form. The individual observations of both lists will be found in this volume.

The heliometer observations of Jupiter's satellites, to the discussion of which the first part of vol. xii. of the Cape Annals is devoted, were made chiefly by Gill and on a few nights by Finlay in the autumn of 1891. They connect satellite with satellite, and do not involve the limb of the planet, the observation of which entails a lower order of accuracy. The main object in view was a determination of the mass of Jupiter, and this requires a most accurate knowledge of the scale value, to which the most careful attention was given. Corrections to all the elements of the satellites, except the mean motions, are involved, and no fewer than twenty-nine quantities enter into the final equations of condition. Duplicate solutions were made, one under the supervision of Mr. Hough, the other with different treatment by Prof. de Sitter. As regards the mass of Jupiter the final result is

$$1/1047{\cdot}50 \pm {\cdot}06.$$

Compared with the best results previously obtained, this value of the denominator seems a little high.

H. C. P.

THE CLOSING OF MUSEUMS.

ACCORDING to the Secretary to the Treasury, "His Majesty's Government are of opinion that the following museums and galleries should be closed to the public: British Museum, Natural History Museum, Science Museum, Geological Museum, Bethnal Green Museum, Tate Gallery, National Portrait Gallery, Wallace Collection, London Museum." The precise sense of the word "should" will appear from events. At any rate, the decision has been made definite in the case of all departments of the British Museum except the reading-room, but the National Gallery and the Victoria and Albert Museum are not to be closed.

This decision will come as a severe blow to those who have been urging the need of a greater regard for science and education, but, in view of

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